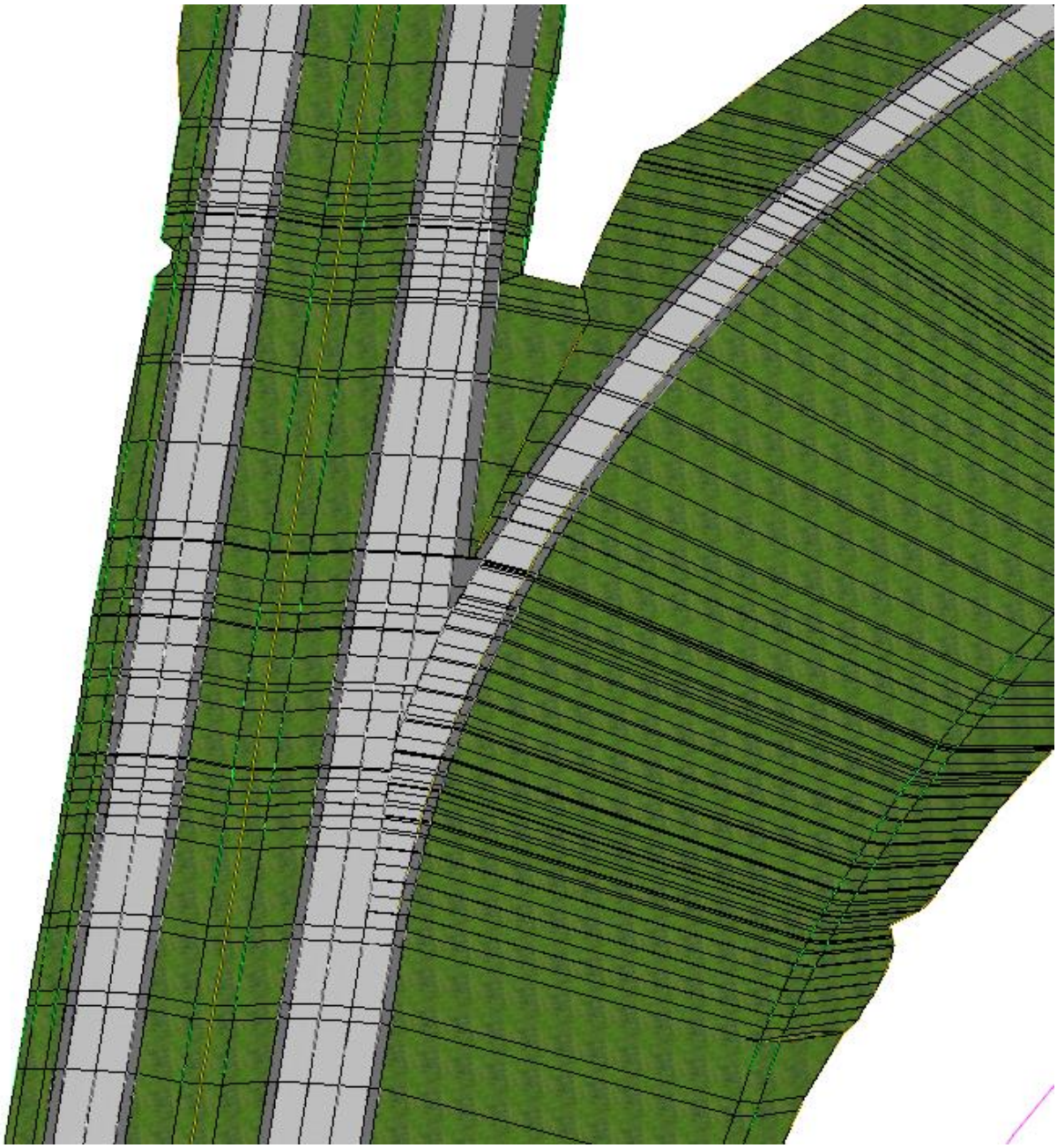
GeoPak Road 2

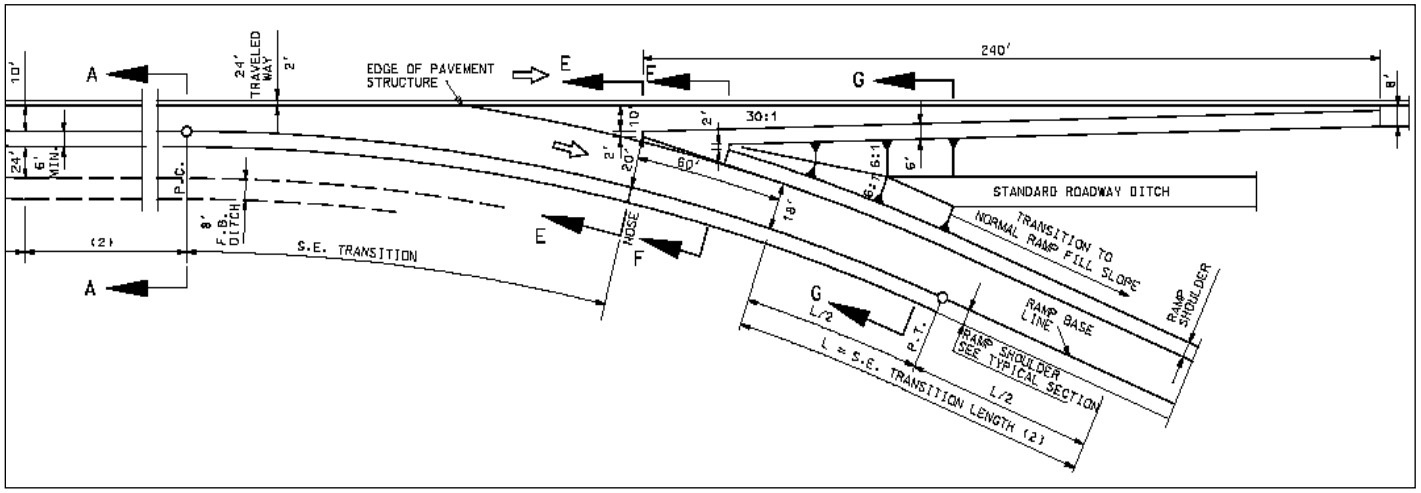
Ramp Transition



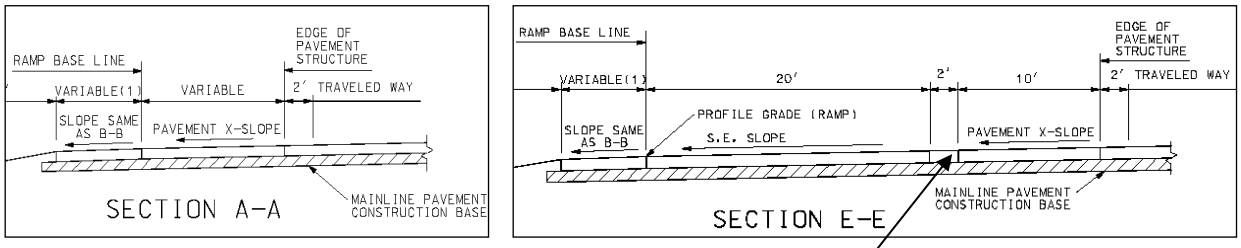
19.1 Group Exercise: Ramp Transition Layout

Objective and Background Information

The objective of this exercise is to demonstrate how the Power GeoPak Civil Tools can be used to create a profile for a ramp transition. This is the area between the sections A-A and E-E in the following figure from Missouri Standard Plans for Highway Construction (203.41). The profile will be applied along the ramp chain.



As the figure indicates, the ramp is in Superelevation transition from the pavement cross slope at Section A-A to the Superelevation required for the beginning curve of the ramp at Section E-E. These two sections as shown in the standard plans are provided below.



The break in the slope between the mainline and the ramp can occur

Before proceeding with the steps to create the profile, a decision needs to be made regarding the location of the break line between the mainline and ramp cross slopes. According to the Design Standards group, the exact location of this break line at Section E-E is not set. It can be located anywhere within the two-foot width of the ramp nose. For the purposes of this exercise, it will be located on the ramp side of the nose and held at a constant offset of 20’ relative to the ramp chain from the ramp nose back to the point where this offset intersects with the mainline edge of pavement. As a designer, you can determine its location for your project.

Also needed is the Superelevation rate at the ramp nose, which is based on the design speed of the ramp and the radius of the curve. The radius of the first curve in Ramp 2 is 1,041 feet.

The relevant portion of the Superelevation table from Missouri Standard Plan 203.20F is shown below. Based on e_{max} = 8%, the ramp's design speed of 40 M.P.H. and a rounded down radius of 1030', the Superelevation for the start of the ramp is 5.8%.

MINIMUM RADII FOR DESIGN SUPERELEVATI
DESIGN SPEEDS, AND e_{max} = 8%

e%	DESIGN SPEED (MPH)															
	30			35			40			45			50			
	RADIUS	L		RADIUS	L		RADIUS	L		RADIUS	L		RADIUS	L		RADIUS
		* 1	* 2		* 1	* 2		* 1	* 2		* 1	* 2		* 1	* 2	
NC	3,240	0	0	4,260	0	0	5,410	0	0	6,710	0	0	8,150	0	0	9,720
RC	2,370	36	55	3,120	39	58	3,970	41	62	4,930	44	67	5,990	48	72	7,150
2.2	2,130	40	60	2,800	43	64	3,570	46	58	4,440	49	73	5,400	53	79	6,450
2.4	1,930	44	65	2,540	46	70	3,240	50	74	4,030	53	80	4,910	58	86	5,870
2.6	1,760	47	71	2,320	50	75	2,960	54	81	3,690	58	87	4,490	62	94	5,370
2.8	1,610	51	76	2,130	54	81	2,720	58	87	3,390	62	93	4,130	67	101	4,950
3.0	1,480	55	82	1,960	58	87	2,510	62	93	3,130	67	100	3,820	72	108	4,580
3.2	1,370	58	87	1,820	62	93	2,330	66	99	2,900	71	107	3,550	77	115	4,250
3.4	1,270	62	93	1,690	66	99	2,170	70	106	2,700	76	113	3,300	82	122	3,970
3.6	1,180	65	98	1,570	70	105	2,020	74	112	2,520	80	120	3,090	86	130	3,710
3.8	1,100	69	104	1,470	74	110	1,890	79	118	2,360	84	127	2,890	91	137	3,480
4.0	1,030	73	109	1,370	77	116	1,770	83	124	2,220	89	133	2,720	96	144	3,270
4.2	955	76	115	1,280	81	122	1,660	87	130	2,080	93	140	2,560	101	151	3,080
4.4	893	80	120	1,200	85	128	1,560	91	137	1,960	98	147	2,410	106	158	2,910
4.6	834	84	125	1,130	89	134	1,470	95	143	1,850	102	153	2,280	110	166	2,750
4.8	779	87	131	1,060	93	139	1,390	99	149	1,750	107	160	2,160	115	173	2,610
5.0	727	91	136	991	97	145	1,310	103	155	1,650	111	167	2,040	120	180	2,470
5.2	676	95	142	929	101	151	1,230	108	161	1,560	116	173	1,930	125	187	2,350
5.4	627	98	147	870	105	157	1,160	112	168	1,480	120	180	1,830	130	194	2,230
5.6	582	102	153	813	108	163	1,090	116	174	1,390	124	187	1,740	134	202	2,120
5.8	542	105	158	761	112	168	1,030	120	180	1,320	129	193	1,650	139	209	2,010
6.0	506	109	164	7113	116	174	965	124	186	1,250	133	200	1,560	144	216	1,920
6.2	472	113	169	669	120	180	909	128	192	1,180	138	207	1,480	149	223	1,820
6.4	442	116	175	628	124	186	857	132	199	1,110	142	213	1,400	154	230	1,730

1) Open **Osage\J5P0555\data\J5P0555_Plan_Overview.dgn**
   a) Review Project scope.

2) Open the **J5P0555_Terrain_Existing.dgn.**
   a) Review the Existing Ground Terrain in file.

3) Create **J5P0555_Civil_Geometry.dgn** using the **i_project_2d_PowerGEOPAK.dgn** as the seed file.
   a) Set Annotation Scale to **50**
   b) Import Alignment and Profile called "**Route50**" and then import the "**Ramp2**" alignment separately from the **job555.gpk**.

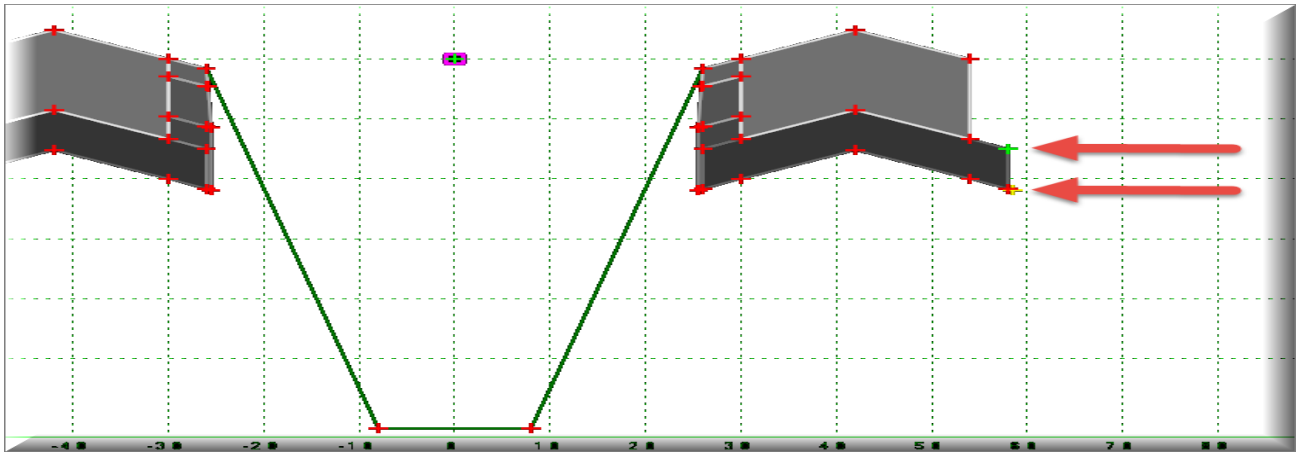
      Note: If the User imports all alignments and profiles in one batch import from the gpk, all profiles will be applied to each alignment.

   c) Reference in the **J5P0555_Terrain_Existing.dgn**, activate the Existing Terrain
   d) Open **Route 50** Profile Model, activate Proposed Profile (if needed)

4) Open **J5P0555_Plan.dgn** File.
   a) Review plan geometry.
   b) Attach **J5P0555_Civil_Geometry.dgn**

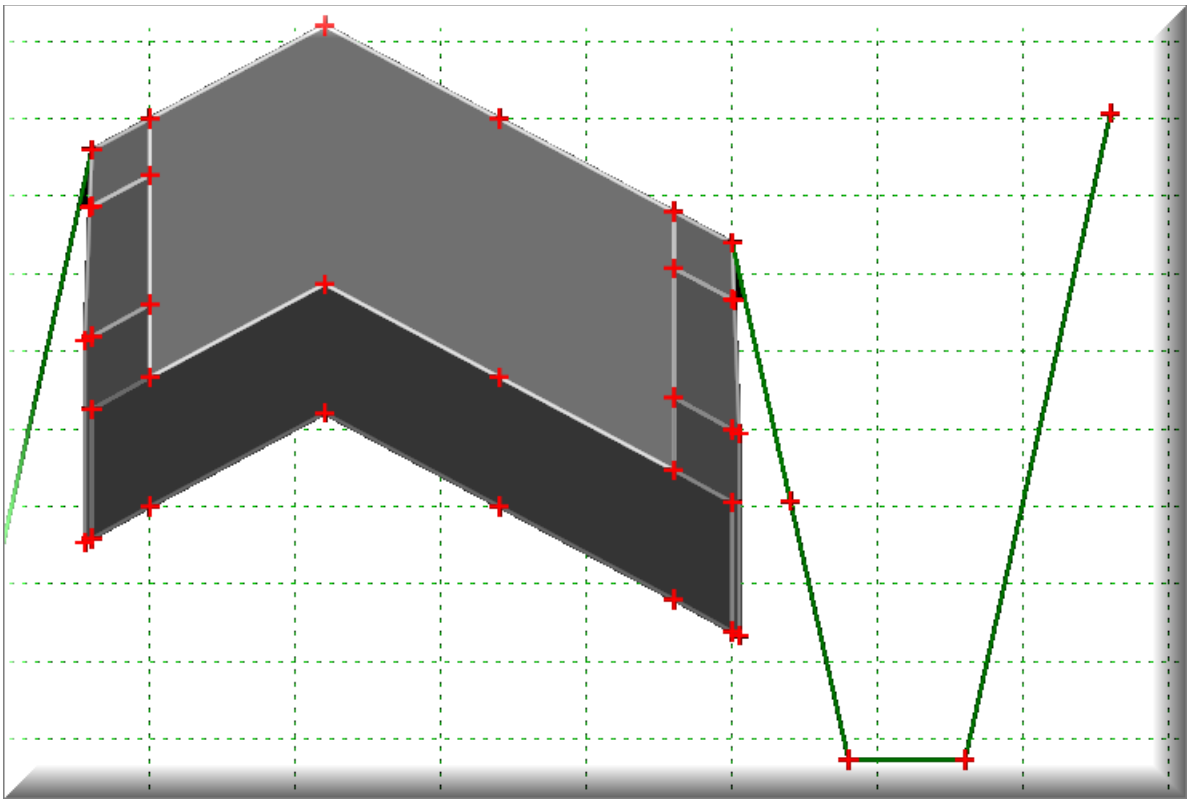
Create template for Route 50 Corridor

5) Create template for Route 50 Corridor
   a) In the Corridor Modeling Task select the **Create Template** icon
   b) Save the Modot.itl to the Project's data folder naming it **J5P0555.itl**
   c) Create a folder under the root directory named **J5P0555**.
   d) Under the J5P0555 folder create a **Route 50** folder.
   e) Copy the following template into the **Route 50** folder:
      - Templates\Concrete Pavement w/ Shoulders\A2 Shoulders Agg Base\ **Concrete Pavement 4 Lane Divided w/ Agg Base Option 3**
   f) Use the Delete Components option and remove the **right outside** Shoulder & Sublayers, Guardrail Widening, and End Conditions. Do not delete Aggregate Base (See picture below).
   g) Delete three outside Aggregate Base points (See arrows below)



Note: The next few steps will add an auxiliary lane on the right side of the template. The auxiliary lane is being added to provide the User a way to transition over a distance the pavements normal slope of (2%) to the slope at the beginning of Ramp 2 (3.87%).

6) In the **Dynamic Settings** dialog, turn on **Apply Affixes**, with X & Y Steps = **0.1**
7) Add the following components to the right side of the template:
    a) Components\Pavement - New\Concrete Pavement w/ Shoulders\A2 Shoulders Agg Base**Concrete Pavement 1 Lane w/ Agg Base Option 3**
    b) End Conditions\Combined**6:1 Fill or 6:1 Foreslope and Backslope Ditch**



8) Optional Step: Merge the common components.

9) Edit the **RT_Conc_T_EOP1** point and.
    a) Toggle off the Horizontal Feature Constraint

10) Edit the **RT_Conc_T_EOP2** point and.
    a) Toggle off the Superelevation Flag
    b) For the Slope Constraint Label enter in **Auxiliary_Lane_Pavement_Slope**
    c) Set Horizontal Constrain distance to 0.001’

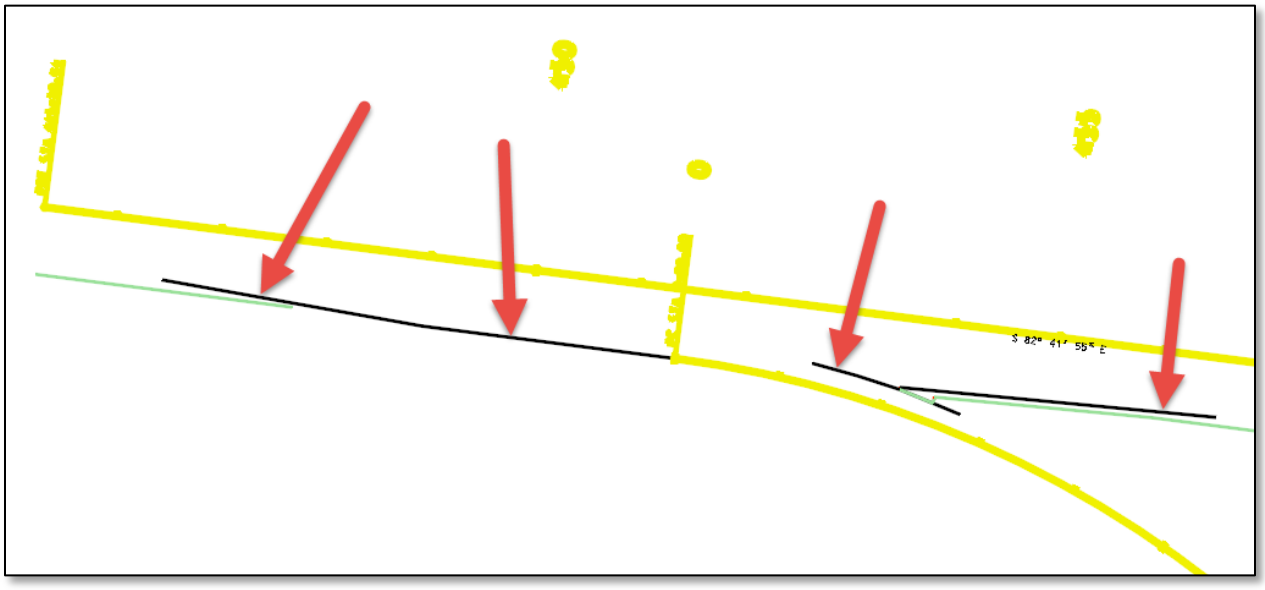
11) Save J5P0555.itl

Create Route 50 Corridor

12) Create **J5P0555_Corridors.dgn** using the **i_project_2d_PowerGEOPAK.dgn** as the seed file.
    a) Reference in **J5P0555_Terrain_Existing.dgn**
    b) Reference in **J5P0555_Plan.dgn**
    c) Reference in **J5P0555_Civil_Geometry.dgn**
    d) Set Annotation Scale to **50**
    e) Activate Existing Ground Terrain.
    f) Select the "**Create Corridor**" tool.
    g) Select the **Route50** baseline (use the active profile) and name the corridor "**Route50"**
    h) Apply Roadway template
        - **J5P0555\Route 50\Concrete Pavement 4 Lane Divided w/ Agg Base Option 3**
        - From Station **445+30.94 R1 to Sta. 460+00 R1**
        - Drop Interval of **5ft**.
            - Note if the drop interval is too large the corridor might not see the Corridor Reference Elements
    i) Select the "**F6**" key to open 3D view of model.
    j) In 3D view adjust brightness up.

13) Make active the J5P0555_Corridors.dgn default Plan View.
    a) Turn off the display of the Corridors 3D file.

14) In the **Route 50 Corridor** add the four individual **EOP_New** lines from the **J5P0555_Plan.dgn** file as corridor references.



15) Add the following two Key Stations to the Route 50 Corridor.
    a) **451+40.67 R1** (Just past beginning of Ramp 2)
    b) **453+55.67 R1** (Just before location of Shoulder Gore nose)

    Note: Use the **Corridor Object Tool** to verify the Key Stations were placed at the correct location.

16) The shoulder width in the Ramp area is going to be narrower than the mainline. In the Route 50 Corridor add the Complex **EOS_New_Asphalt** line from the J5P0555_Plan.dgn file as Corridor References.

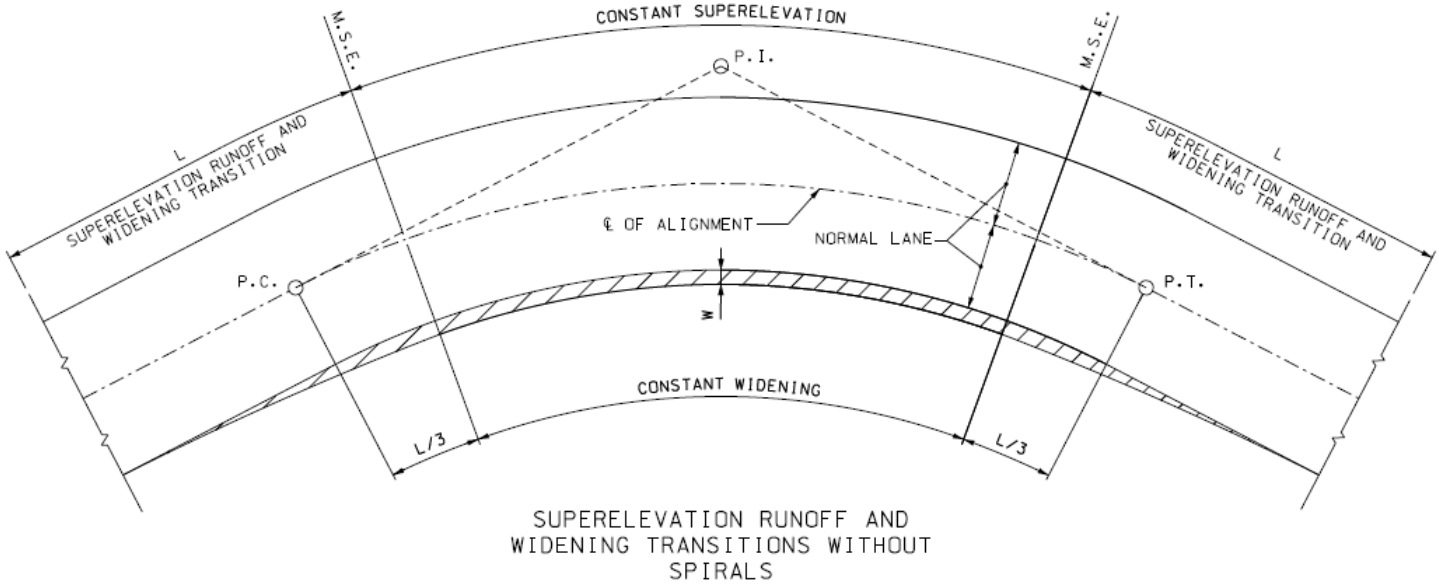
    Notes:
    - The **EOS_New_Asphalt** plan elements were complexed together using the **Civil Geometry - Horizontal - Complex By Elements** Tool.
    - The shoulder is going to vary in width in certain areas of the project. The plan shoulder element (**EOS_New_Asphalt**) will control the width in these areas

17) Add the following Key Stations to the Route 50 Corridor.
    a) **453+88.86 R1** (Just before location of Median Gore nose)

    Notes:
    - If a template drop does not cross an individual corridor reference element, the Corridor will not draw to that corridor reference element.
    - Use the **Corridor Object Tool** to verify the Key Stations were placed at the correct location.

Calculation of Ramp 2 Vertical Complex Element (Profile)

18) Create **J5P0555_Superelevation.dgn** using the **i_project_2d_PowerGEOPAK.dgn** as the seed file.
   a) Reference in **J5P0555_Civil_Geometry.dgn**
   b) Reference in **J5P0555_Plan.dgn**
   c) Review the undivided non-spiraled Superelevation runoff diagram below.



SUPERELEVATION RUNOFF AND WIDENING TRANSITIONS WITHOUT SPIRALS

19) Select **Create Superelevation Section**

Name:	Ramp2
Alignment:	Ramp2
Start Station:	Beginning of Alignment
Stop Station:	End of Alignment
Minimum Transition Length	0.00’

Note: If two Superelevation Sections are created, delete second Section and then extend the First section to the end of the Ramp 2 alignment.

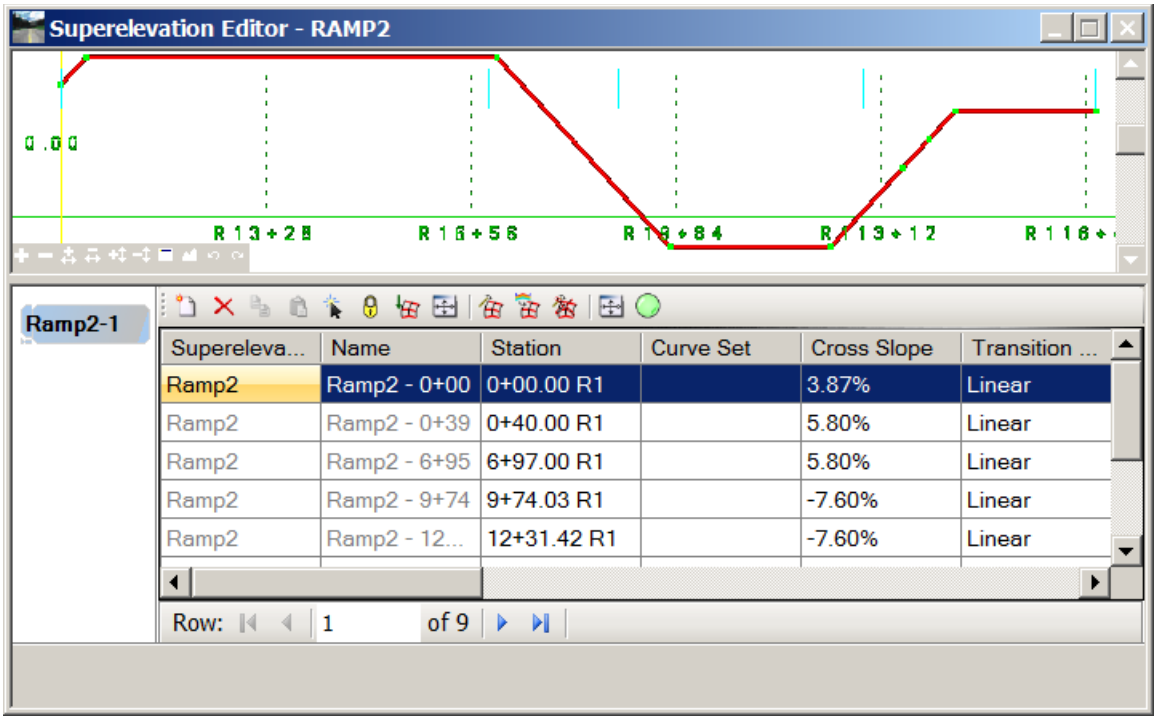
20) Select **Create Superelevation Lanes**

Lane Name:	Ramp2
Type:	Primary
Side of Centerline:	Left
Inside Edge Offset:	0.00’
Outside Edge Offset:	12.00’
Normal Cross Slope:	2.00%

21) Select **Calculate Superelevation**

Standards File Name:	T:\MoDOT_Workspace\Gpk_Std\Superelevation\english_2011.sep
e Selection:	8% - 40 mph
L Selection:	All Cases
Design Speed:	40
Transition ID:	Linear
Number of Lanes:	1
Facility	Undivided
Open Editor	Yes

Below is a view of the Superelevation Editor for Ramp 2

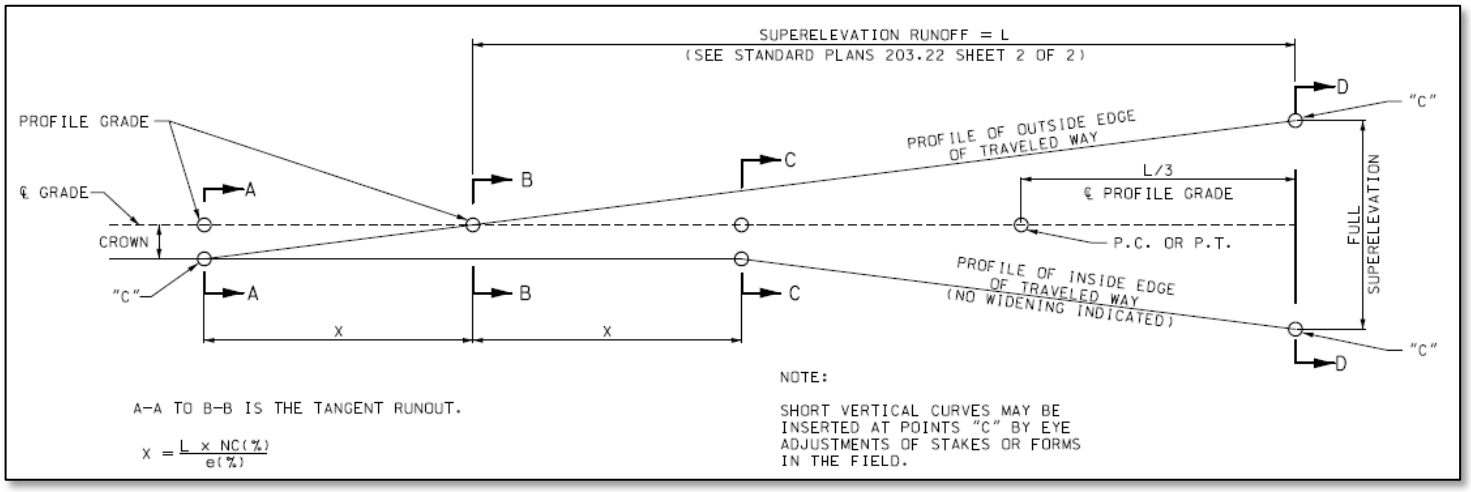


22) Next calculate the transition distance of the Mainline Pavement in the transition area before the PC location of the Ramp2 Curve.

x = (120)(2%)/(8%) = 30’

Distance from C-C section to PC = L - (L/3) - x = (120’) - (120’/3) - 30’ = 50’

Note: This is the distance the Auxiliary Lane will have to transition from 2% (Mainline Slope) to a 3.87% (Ramp 2 Slope) at the PC location of the Ramp



23) Open the **J5P0555_Corridors.dgn.**

24) For the next step select the **Corridor Views > Open Cross Section Model** and verify the **Route 50 Mainline Ramp Pavement** is transitioning downward**.** Use the **Place Temporary Dimension Line** to verify the slopes of the mainline pavement.

25) Apply the following Parametric Constraint**.**
   a) Route50 Station at Ramp2 start = Sta. 451+40.67
   b) Transition Start Station = Sta. 451+40.67 - 50’ = Sta. 450+90.67

Start:	450+90.67 R1
Stop:	451+40.67 R1
Constraint Label:	Auxiliary_Lane_Pavement_Slope
Start Value:	-2.00%
Stop Value:	-3.87%

Create templates for Ramp 2 Corridor

26) Create template for Ramp2 Corridor
   a) In the Corridor Modeling Task select the **Create Template** icon
   b) Open the **J5P0555.itl**
   c) Navigate to the **J5P0555** and **Create** a new folder called **Ramp2**
   d) Right click on **Ramp2** folder and select **New > Template**
   e) Name the Template **Ramp2**
   f) In the **Dynamic Settings** dialog, turn on **Apply Affixes**, with X & Y Steps = **0.1**
   g) Use the following Components and End Conditions to create the **Ramp2** Template:

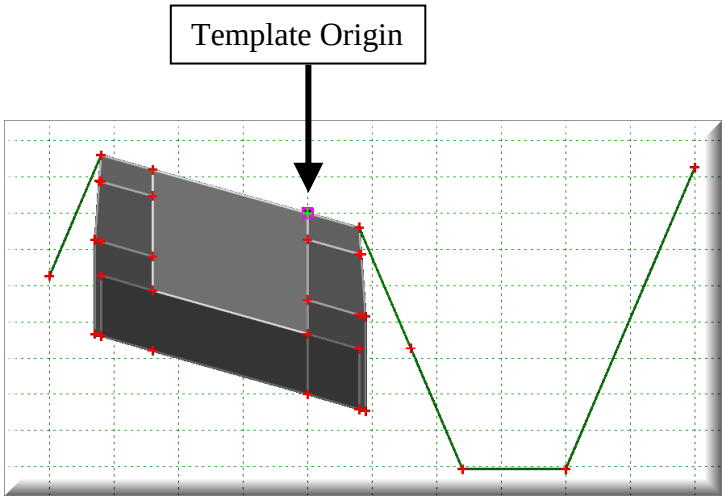
Template Components:

Left Side

Concrete Pavement 1 Lane w/ Agg Base Option 3

Right Side

A2 Shoulder Asphalt Option 3 w/ Agg Base



Template End Conditions:

Left Side

Fill Slope (6:1)

Right Side

6:1 Fill or 6:1 Forslope and Backslope Ditch

*Notes

a) **Concrete Pavement 1 Lane w/ Agg Base Option 3** is located in the following location:
   Components\Pavement - New\Concrete Pavement w/ Shoulders\A2 Shoulders Agg Base\
b) **A2 Shoulder Asphalt Option 3 w/ Agg Base** is located in the following location:
   Components\Shoulders\Asphalt Adjacent to Concrete Pavt w/o Curb\
c) **6:1 Fill or 6:1 Forslope and Backslope Ditch** is located in the following location:
   End Conditions\Combined\
d) Adjust pavement slope to be 2% going up from baseline.
e) If not already done so, adjust the shoulders to follow the pavement slope using a Vector Offset constraint.
f) Check Priorities on End Conditions using the "**TEST**" button

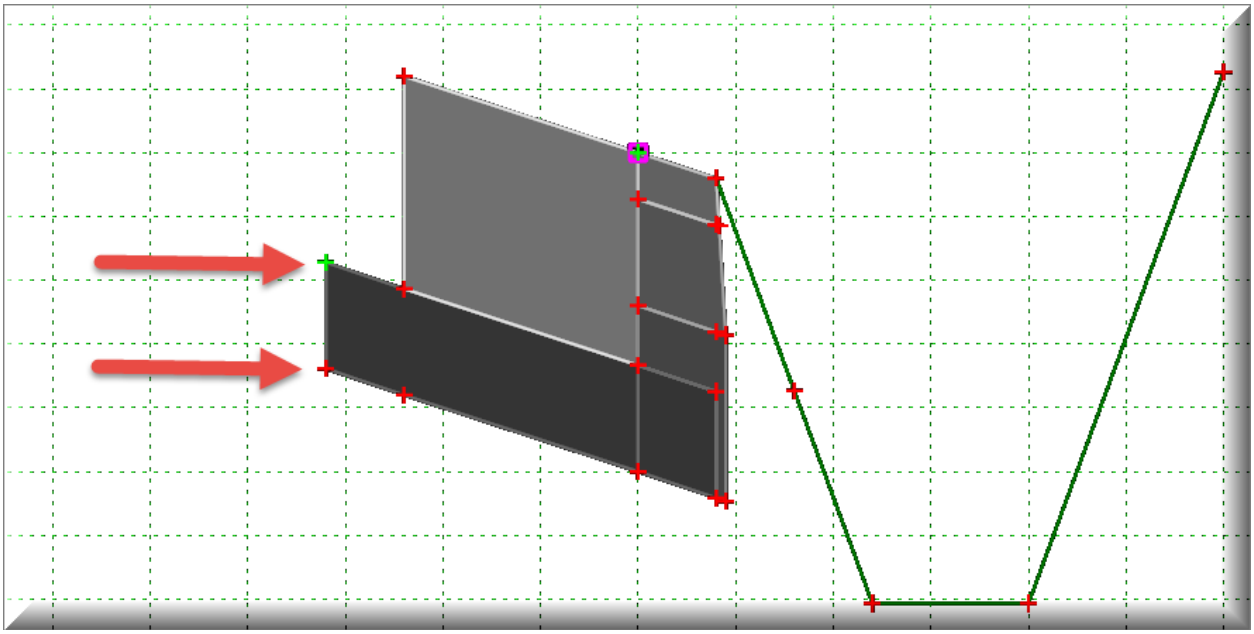
Next we will need to create another **Ramp2** template for the area where the ramp and mainline butt up to each other.

27) Copy and paste the "**Ramp2"** Template located in the **Ramp2** folder.

28) Name new template "**Ramp2 - No LT Shoulder".**

29) Use the Delete Components option and remove the **left outside** Shoulder & Sub layers, and End Conditions. Do not delete Aggregate Base (See picture below).

30) Delete two Aggregate Base points (See arrows below)



31) Save Template Library

Create Ramp 2 Profile

32) Open the **J5P0555_Superelevation.dgn** file and review superelevation sections.
   a) Verify slope at PC location is **3.87%**
   b) Verify slope at Max Super is **5.80%**

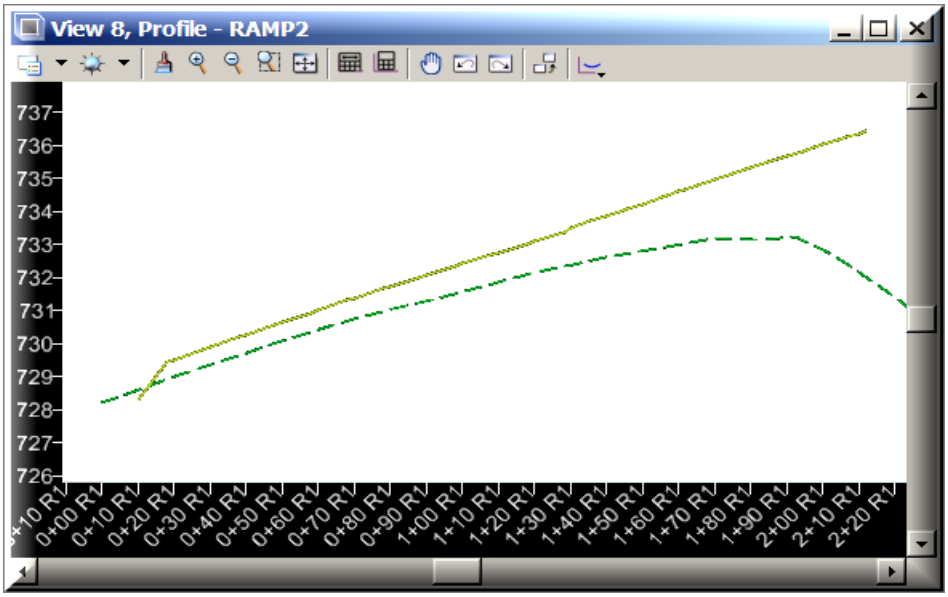
33) Open the **J5P0555_Civil_Geometry.dgn** file.
   a) Reference in the **J5P0555_Corridors.dgn** file.

34) Open the **Profile Model** for the **Ramp2** corridor.

35) From the **Route50** edge of pavement, project the superelevation slope down to the Ramp2 baseline. Use the Civil Tools - Vertical Geometry - **Profile by Variable Slope from Element**.

Slope Style:	Linear
Plan Element:	Ramp2 Baseline
Reference Element:	EOP_New line between Ramp and Mainline
Constraint Label:	LT_Pvmt_Surf_Conc_Slope
Start Distance:	6+10.01 (Ramp2 Sta. 0+00.00)
Start Value:	-3.87%
Stop Distance:	8+38.19 (Ramp2 Sta. 2+12.42)
Stop Value:	-5.80%
Vertical Offset:	0.00’

Note: The profile created in the previous step should look like the top profile below. Because the Reference Element (Mainline EOP) had 90 degree edges near the beginning of Ramp2, a kink is produced in the resulting profile. The 90 degree edges was created because the EOP_New plan lines are being targeted with Corridor References.



36) To create a profile without a kink, remove the **EOP_New** Corridor Reference nearest the PC of the Curve.
   a) Open the **J5P0555_Corridors.dgn** file
   b) From the Corridor heads up tools, select "**Remove Corridor Reference**"

37) Open the **J5P0555_Civil_Geometry.dgn** file.

38) Open the **Profile Model** for the **Ramp2** corridor.

39) From the **Route50** edge of pavement, project the superelevation slope down to the Ramp2 baseline. Use the Civil Tools - Vertical Geometry - **Profile by Variable Slope from Element**.

Slope Style:	Linear
Plan Element:	Ramp2 Baseline
Reference Element:	EOP_New line between Ramp and Mainline
Constraint Label:	LT_Pvmt_Surf_Conc_Slope
Start Distance:	6+11.43 (Ramp2 Sta. 0+00.00)
Start Value:	-3.87%
Stop Distance:	8+27.60 (Ramp2 Sta. 2+12.42)
Stop Value:	-5.80%
Vertical Offset:	0.00'

   a) Note if you add EOP_New Corridor Reference back in the kink will show back up. The profile is dynamically linked to the EOP profile.

40) Open the **Route50** Profile model and verify the profile grade at Sta. **451+40.61** is **4.00%**

41) Reopen The **Ramp2** Profile model.

42) Using the Vertical Geometry **Profile Line Between Points** place a 4% slope before the Projected Ramp2 profile.

43) Using the Vertical Geometry **Parabola from Element** place a vertical curve from the start of the projected profile to the end. After starting the tool, select the 4% profile line as the Reference Profile. After placing the start point, define the endpoint of the vertical curve by Accu-Snapping to the endpoint of the Projected Profile. When asked to Trim, select the "**None"** option.

   - Note: Use Civil AccuDraw to help start the profile at **Sta. 0+00.00**

44) The last VPI for the **Ramp2** profile will be where the ramp chain **crosses the Bighorn crossroad gutter line**. This point is **offset 18.5'** from the crossroad centerline. The elevation of the crossroad at this point and corresponding ramp station has already been determined below. Based on this, **the last VPI at the end of the profile should use the following VPI station and elevation**.

Station	**Elevation**
16+36.81	**763.92**

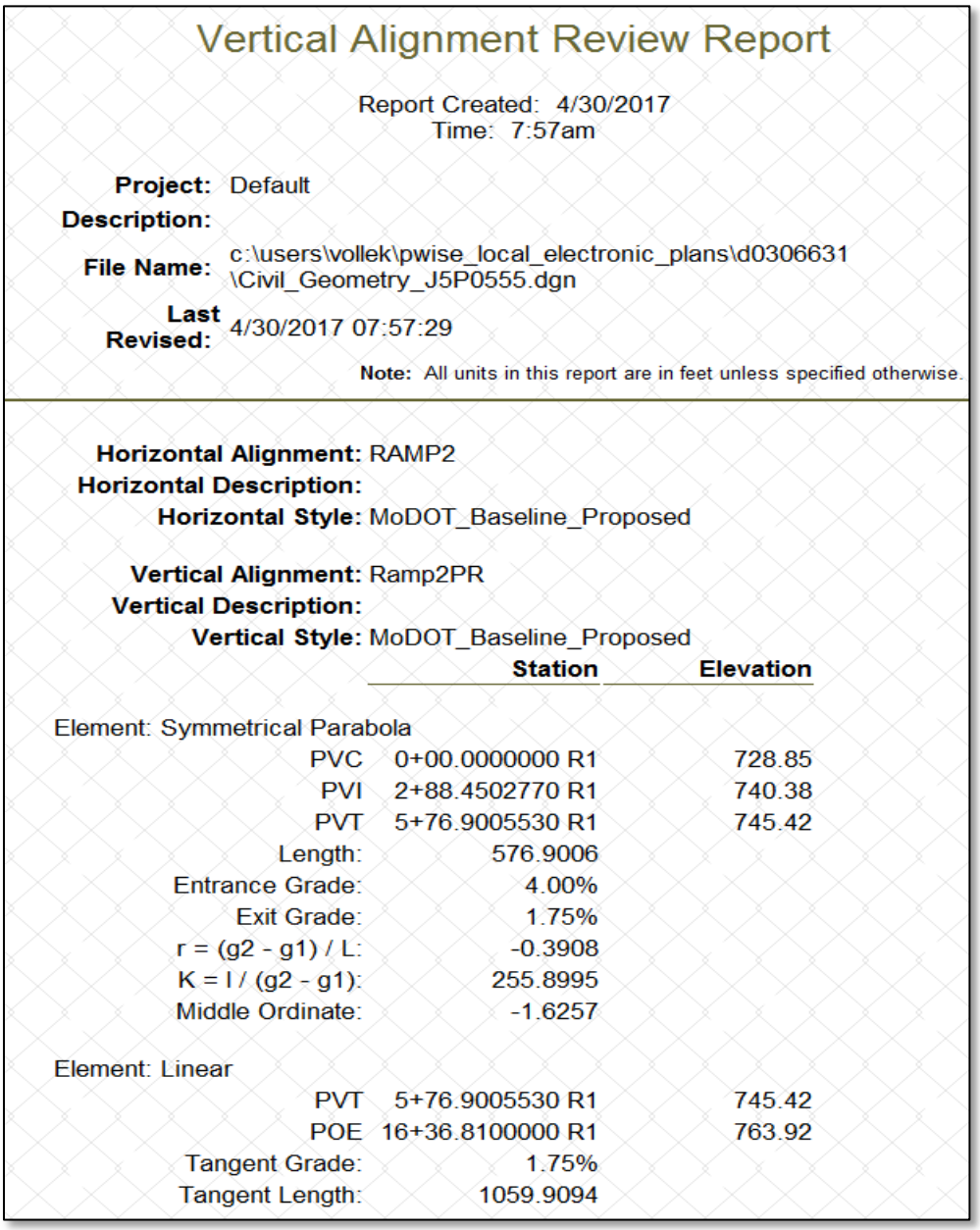
45) Using the Vertical Geometry **Tangent Profile Line to Element** select the previously place profile line and using AccuDraw place the endpoint at **Sta. 16+36.81** at an **Elevation of 763.92**. When asked to Trim, select the "**Back"** option.

46) Delete the **4% Profile** line located before the PC Point and the **Projected Profile**.

47) Join the two profile elements using the Vertical Geometry **Profile Complex By Elements**, naming the profile **Ramp2PR**

48) Set the **Ramp2PR** profile as **active**.

49) Run the Vertical Alignment Report on the Ramp2PR.



Vertical Alignment Review Report

Report Created: 4/30/2017
Time: 7:57am

Project: Default
Description:
File Name: c:\users\vollek\pwise_local_electronic_plans\d0306631\Civil_Geometry_J5P0555.dgn
Last Revised: 4/30/2017 07:57:29

Note: All units in this report are in feet unless specified otherwise.

Horizontal Alignment: RAMP2
Horizontal Description:
Horizontal Style: MoDOT_Baseline_Proposed

Vertical Alignment: Ramp2PR
Vertical Description:
Vertical Style: MoDOT_Baseline_Proposed

		Station	Elevation
Element: Symmetrical Parabola			
	PVC	0+00.0000000 R1	728.85
	PVI	2+88.4502770 R1	740.38
	PVT	5+76.9005530 R1	745.42
	Length:	576.9006	
	Entrance Grade:	4.00%	
	Exit Grade:	1.75%	
	r = (g2 - g1) / L:	-0.3908	
	K = l / (g2 - g1):	255.8995	
	Middle Ordinate:	-1.6257	
Element: Linear			
	PVT	5+76.9005530 R1	745.42
	POE	16+36.8100000 R1	763.92
	Tangent Grade:	1.75%	
	Tangent Length:	1059.9094	

50) Open the **J5P0555_Corridors.dgn** file.
51) Reapply the **EOP_New** element located just before the beginning of Ramp2 as a **Corridor Reference** for the **Route50** corridor.

Create Ramp2PR Corridor

52) Select the "**Create Corridor**" tool.

53) Select the **Ramp2** baseline and name the corridor "**Ramp2"**

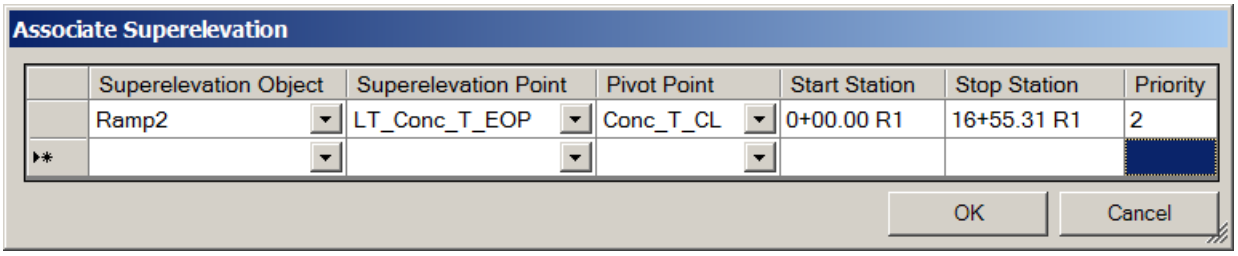
54) Apply Roadway template
   a) **J5P0555\Ramp2\Ramp2 - No LT Shoulder**
   b) From Station **0+00.00 R1** to **Sta. 2+45.18 R1**
   c) Drop Interval of **1ft**.

55) From the **Route 50 Corridor** clip out the **Ramp2 Corridor**.

56) Apply Roadway template
   a) **J5P0555\Ramp2\Ramp2**
   b) From Station **2+45.19 R1** to **Sta. 15+00 R1**
   c) Drop Interval of **10ft**.

57) If needed select the "**F6**" key to open 3D view of model.

58) Reference in the **J5P0555_Superelevation.dgn** file.
   a) Assign Superelevation to the **Ramp2** Corridor.
   b) The slope of the pavement before the shoulder nose will be controlled by Route 50 Edge of Pavement.
   c) The slope of the pavement after the shoulder nose will be controlled by the Superelevation shape. Therefore adjust the **Priority** of the Superelevation Point Control to be greater than 1.
   d) In the Reference Dialog Turn off the Superelevation View.



59) To make the **Ramp2** pavement draw up to the **EOP** of the **mainline** set the following Point Control:

Start Station:	0+00
Stop Station:	2+12.42 (just shy of the shoulder nose)
Description:	Draw to Mainline EOP
Mode:	Both
Control Type:	Corridor Feature
Point:	LT_Conc_T_EOP
Corridor:	Route50
Reference Feature:	RT_Conc_T_EOP2
Priority:	1
Horz. & Vert. Offset:	0

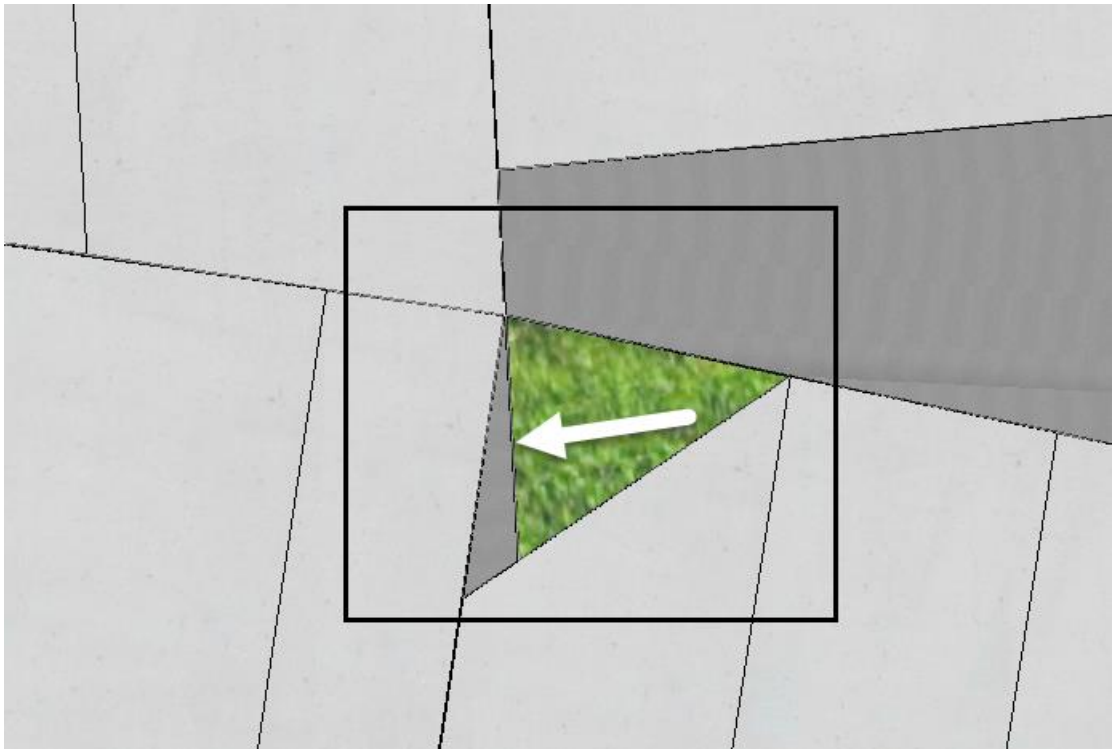
60) Clip the **Ramp2** Corridor from the **Route50** Corridor.

61) To make the **Ramp2** pavement draw up to the **EOS** of the mainline (in the area of the shoulder median), set the following Point Control:

Start Station:	2+12.44
Stop Station:	2+12.44
Description:	Draw to Mainline EOS
Mode:	Both
Control Type:	Corridor Feature
Point:	LT_Conc_T_EOP
Corridor:	Route50
Reference Feature:	RT_AsphSurf_T_O_EOS1
Priority:	1
Horz. & Vert. Offset:	0

62) To make the Ramp 2 Pavement model correctly, the Route 50 shoulder indicated by the white arrow needs to be removed.

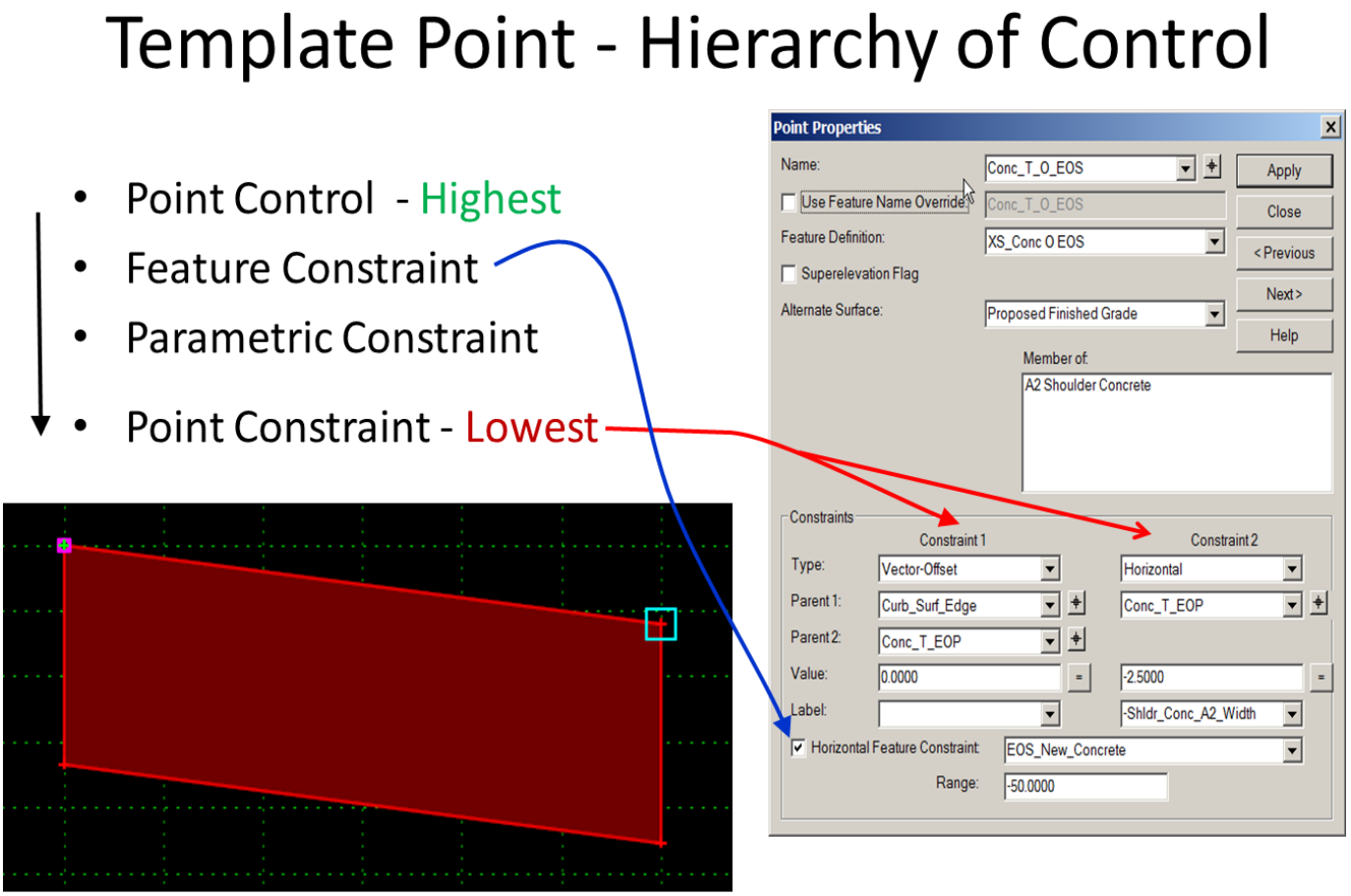
Because there is shoulder width in the area indicated by the white arrow, the pavement of Ramp 2 is not allowed to draw to the Route 50 Edge of Shoulder near the Shoulder Median Nose.



63) In the Route 50 Template modify the RT_AsphSurf_T_O_EOS1 point and modify the Horizontal Constraint Label from **Shldr_Asph_A2_Width** to **RT_Outside_Shldr_Asph_A2_Width**.

Notes:

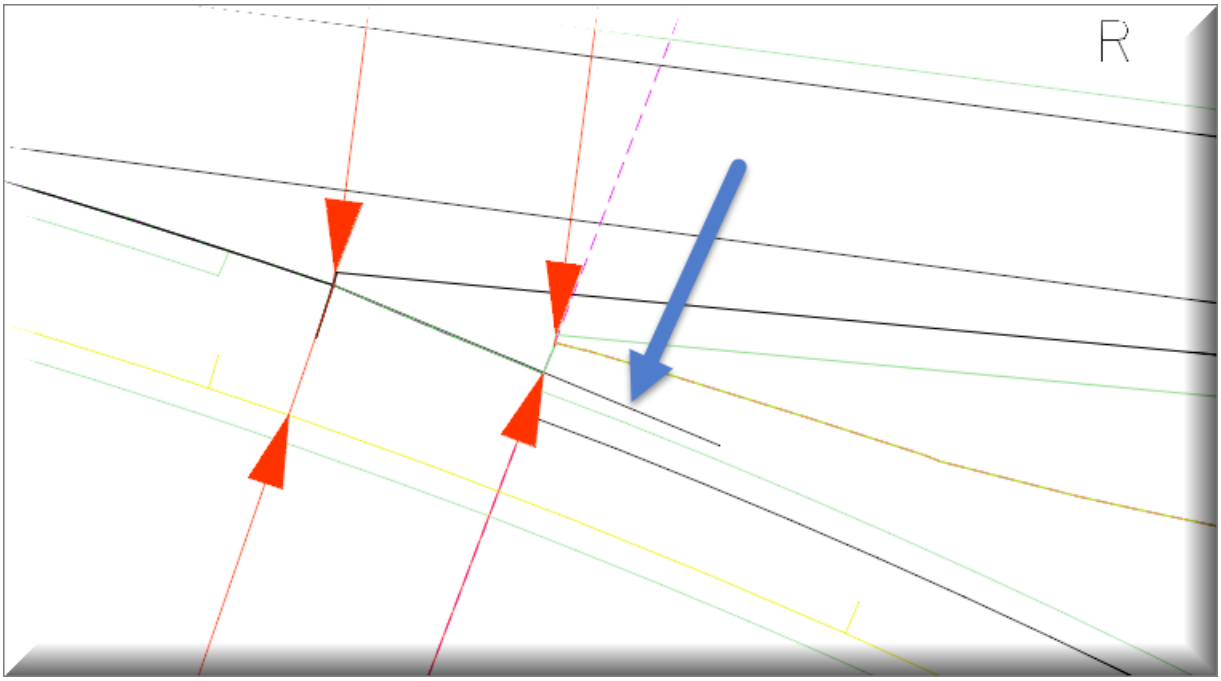
- In the next step we will use a Parametric Constraint to set the Route 50 Shoulder Width to zero in the area above.
- The benefit to using a Parametric Constraint is because it's a lower level of control than the Feature Constraint. Therefore the User just has to define a general station range to apply the Parametric Constraint around the shoulder gore area and let the Plan Element of the Feature Constraint exactly define the limits of the shoulder gore nose.
- See next page for Template Point Hierarchy of Control



64) Apply the following Parametric Constrain to the **Route 50 Corridor** to set the Shoulder Width to zero around the Shoulder Nose.

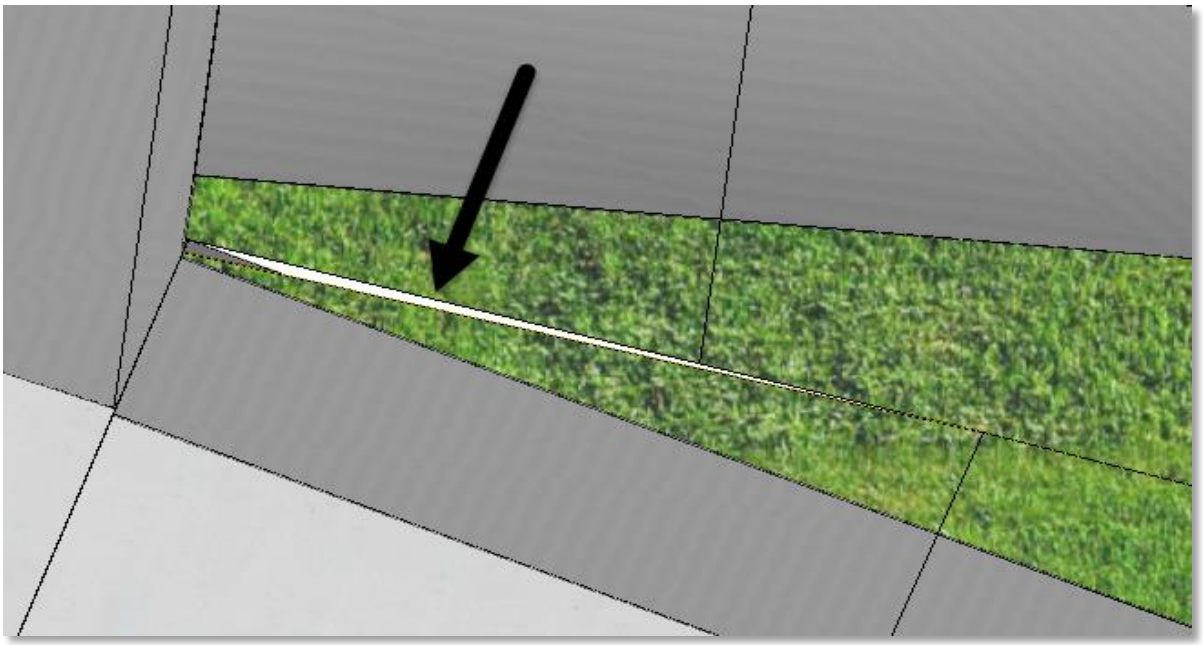
Start:	453+40.00 R1 +/-
Stop:	453+70.00 R1 +/-
Constraint Label:	RT_Outside_Shldr_Asph_A2_Width
Start Value:	0.00
Stop Value:	0.00

65) Add the **EOP_New** line that transitions from an 18’ offset to a 20’ offset as corridor references in the **Ramp2 Corridor**. The EOP line is near the grass gore point (see below).



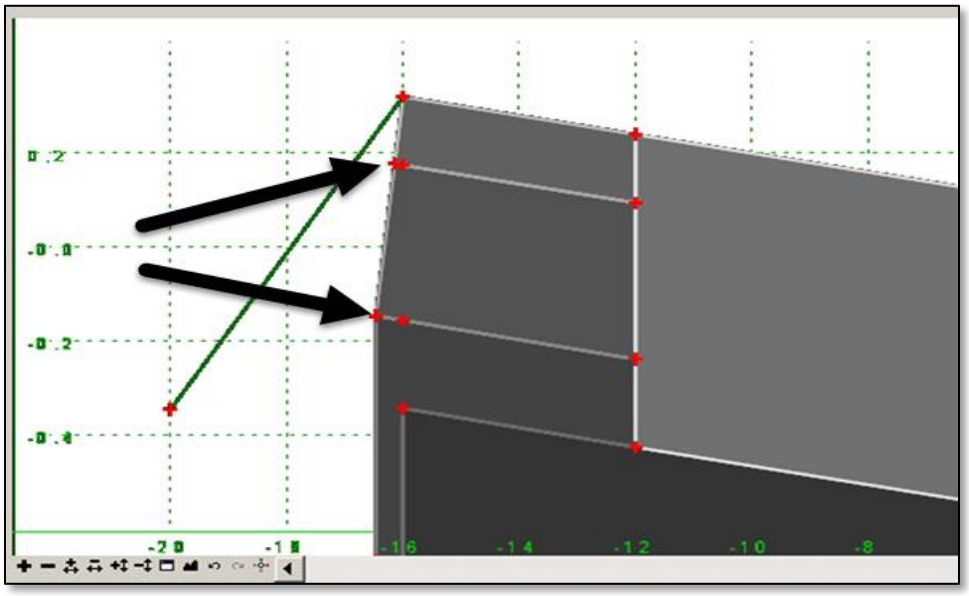
66) Within the **Ramp 2** Corridor, **Target Alias** the Route 50 Corridor.

67) The gap in the grass gore area is being caused by the Ramp 2 Pavement and Aggregate components. Those components are clipping out the components in the Route 50 Corridor.



68) To remove the gap from the previous step, edit the **Ramp 2** Template and remove the slope of the pavement and aggregate in the area of the gap.

Edit the two outer points in the Ramp 2 template (indicated below) by adding a Slope label named **Pavement and Aggregate Edge Slope**

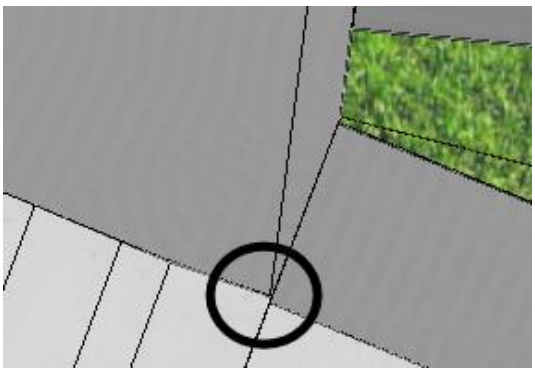


69) Apply the following Parametric Constrain to the **Ramp 2 Corridor** to set the **Pavement and Aggregate Edge Slope** to a near vertical slope.

Start:	2+43.00 R1 +/-
Stop:	2+72.00 R1 +/-
Constraint Label:	Pavement and Aggregate Edge Slope
Start Value:	1000.00%
Stop Value:	1000.00%

70) Edit the J5P0555\Ramp2**Ramp2** template and modify the **Horizontal Constraint** for the **LT_Conc_T_EOP** point to a width of 18'.

71) Near the Grass Nose there is a kink in the pavement. To remove this kink add Ramp 2 a **Key Station** at **Sta. 2+45.17 R1**



Create Special Ditch - Drawing the Ditch Foreslope to a Alignment and Profile

72) In the **J5P0555_Civil_Geometry.dgn** create following Ditch Alignment and Profile.

a) Use the Horizontal Geometry Tool **Complex By PI** to place a line with a Feature Definition of **Design\Design Standards\Drainage\Special_Ditch_Right** at the following locations:

- Note: use **Civil AccuDraw** to place line accurately along the **Route50** and **Ramp 2** Alignment.
- Use a radius of **200'**
- Name the ditch alignment: **Special Ditch**

Station	Offset	Chain
445+30.94	120	Route50
448+70.00	120	Route50
449+50.00	150	Route50
1+00	90	Ramp2
5+00	70	Ramp2
10+00	100	Ramp2

b) Open the **Special Ditch Profile** View. Use the Vertical **Profile Line Between Points** Tool to place a profile with the following VPIs:

- Note: use **Civil AccuDraw** to place profile accurately along the **Special Ditch** Alignment.
- Name this profile: **Special Ditch Proposed**
- Make the profile **Activate**

Station	Elevation
0+00	688.00
15+75.75	704.00

73) In the **J5P0555_Corridors.dgn** file create following Point Controls to have the ditch bottom foreslope point draw the special ditch.

a) **Route 50 Corridor**:

Start Station:	Beginning of Alignment
Stop Station:	451+40.67 R1
Control Description:	Draw to Special Ditch Alignment
Mode:	Both
Control Type:	Linear Geometry
Point:	RT_Dtch_Frslp_1_B
Plan Element:	Special Ditch
Profile Element:	Special Ditch Proposed
Secondary Alignment:	Yes
Priority:	1
Horz. & Vert. Offset:	0

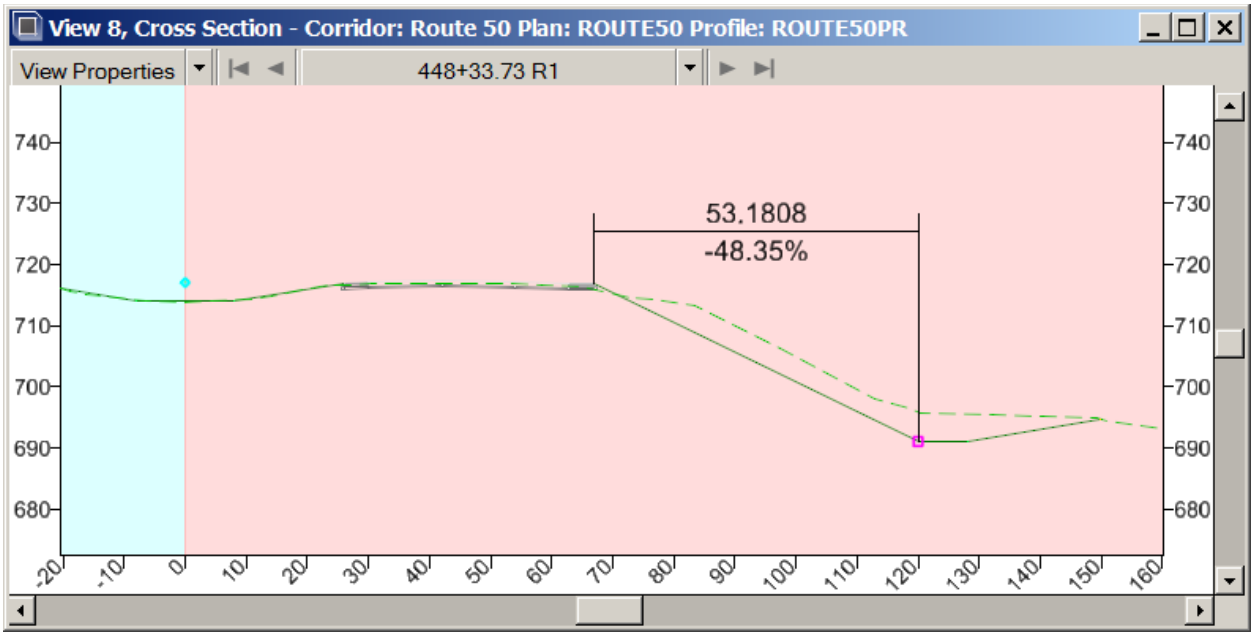
Step 72) Continued:

b) **Ramp 2 Corridor**:

Control Description:	Draw to Special Ditch Alignment
Start Station:	Beginning of Alignment
Stop Station:	16+55.31 R1
Mode:	Both
Control Type:	Linear Geometry
Point:	RT_Dtch_Frslp_1_B
Plan Element:	Special Ditch
Profile Element:	Special Ditch Proposed
Secondary Alignment:	Yes
Priority:	1
Horz. & Vert. Offset:	0

74) Open the **Route 50 Dynamic Cross Section** Model View. Place **Temporary Dimension Lines** along the Ditch Foreslope. You should notice that the slope is changing from section to section because the bottom ditch foreslope point has to hit the Special Ditch Alignment and Profile.

In the next few steps, the parameters will change such that the slope remains constant and the ditch will follow the ditch elevation.

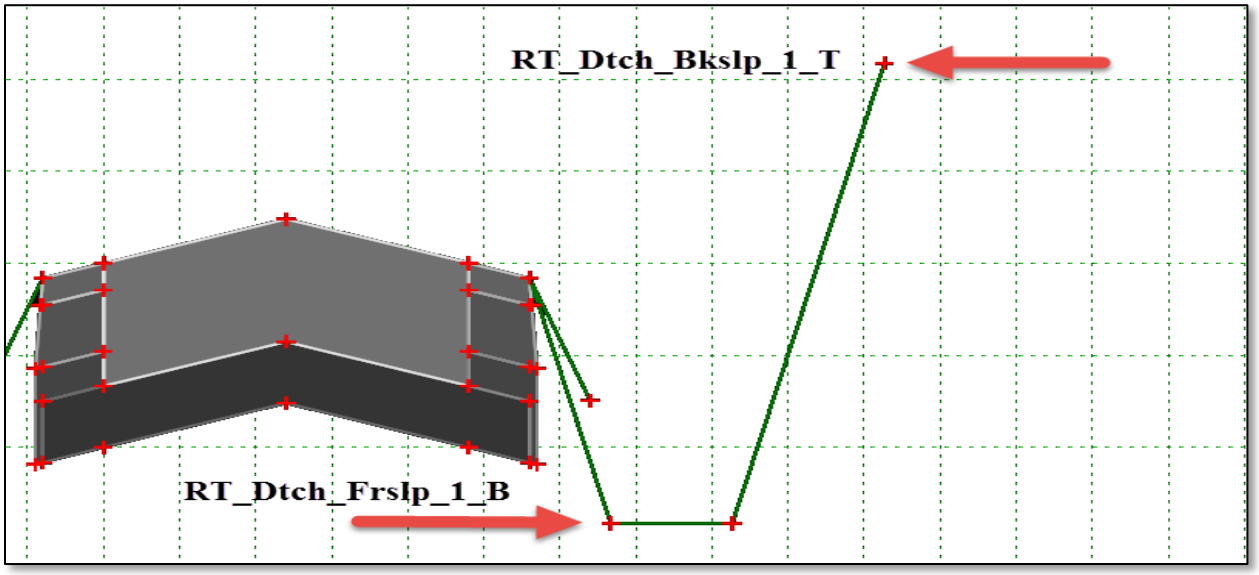


Create Special Ditch – Drawing to a Ditch Profile while holding constant the Ditch slope

75) In order to draw to Ditch profile some points in the Ditch Component need to be redefined in all three template drops on the south side of the project.

a) Edit the RT_Dtch_Frslp_1_B point.
- Adjust the slope to -25.00%
- Change the **Horizontal Constraint** to a **Vertical Constraint**.

b) Edit the RT_Dtch_Bkslp_1_B point.
- Adjust the slope to 25.00%



76) In the **Route 50** and **Ramp 2** Corridors, edit the Special Ditch Point Controls by changing the **Point Control Mode** from **Both** to **Vertical**.